

A REPORT ON THE  
OXFAM SANITATION UNITS IN  
BANGLADESH, FEBRUARY 1977

By Everett Ressler, INTERTECT



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Introduction

The criteria upon which the OXFAM Sanitation Unit was developed were described in the July 1975 OXFAM technical paper entitled "OXFAM's Sanitation Unit". Those criteria can be summarized as follows:

1. The provision of an acceptable place for excretion.
2. Retention of the excreta....to render it harmless.
3. Safe disposal of effluent and solids.
4. The unit should be lightweight, low bulk, inexpensive, and packaged complete.
5. Rapid installation capabilities.
6. Useful irrespective of soil conditions.
7. Should operate by gravity.
8. No chemical dosing procedures should be required.
9. Manageable maintenance.
10. Mobile.

From an examination of the technical papers published about the Sanitation Unit, from an inspection of the Units, and from discussions with personnel who have installed and maintained the Units in Bangladesh, it can be concluded that the OXFAM Sanitation Units do indeed meet most of these criteria.

The purpose of this paper is to very briefly examine the advantages and limitations of these Units.

I. Number of Units

As of August 1976, twenty-four Units were fully operational in Bangladesh; thirteen were under construction; and twenty-three more Units were being planned. The original test period -- from July 1975 to July 1976 -- has been extended as an on-going sanitation program through 1979.

II. Units Compared with Criteria

1. The provision of an acceptable place for excretion:

Structure: The structures which house the squatting plates are simply constructed of local materials and very functional. The structures also appear to have withstood the wear of high volumes of people very well. All Units are within high density areas and appear to be well accepted.

Use: Acceptability is also indicated by use. Counts of the number of users have been carried out. In Mirpur, the first Unit is reported to have had approximately 1,000 uses per day. The second Unit reports 1,200 uses per day, and the third Unit 900 uses per day. The time of highest use is between 5:00 and 8:00 A.M. The Units are visited primarily for defecation and are not used by children under five years. (OXFAM is reportedly developing a squatting plate for children.)

Some of the factors which seem to contribute to the use of the Units include convenience of location, little to no foul odors, and cleanliness.

2. Retention of the excreta ... to render it harmless: The use of the butyl rubber tanks as digestors is reported to be effective in reducing the number of harmful bacteria. Lloyd reported that in some cases, not all bacteria had been destroyed, and suggested that the causes included overloading and a design problem that permits the most recent sewage to be removed in desludging at the same time the digested sludge is flushed out. Suggestions have been made to correct these problems, and further testing will be required to assess the effectiveness of the corrective measures. Bacterial testing is being carried out in the on-going project.

3. Safe disposal of effluent and solids: The disposal of the effluent continues to be problematic. The filters as designed to date have proven inadequate for the volume of solids in the effluent. Alternatives are being explored by the use of materials other than brick; even lagooning is being considered. Examples of unplanned lagooning, outside protected areas, were noted. No solution has been found to date, but alternatives are being researched.

Sludge from the digester tanks is allowed to dry in beds, then composted. As some fertile parasites were found in the sludge (as reported by Lloyd), a dry composting is recommended. Further testing is required to assess the effectiveness, particularly during the rainy season.

The disposal of the compost is through use in available fish ponds as fertilizer for the plankton or as garden fertilizer. In Mirpur it was reported that the dry compost was acceptable by the people for garden fertilizer. However, this was not reported to be the case in Demra and Tongi.

4. The Unit should be lightweight, low bulk, inexpensive and packaged complete: The general design appears to be masterfully simple. It uses all imported parts (except for the structure), particularly adapted for the unit. Whether the Unit is inexpensive depends upon what the costs are compared with. No cost comparison with locally purchased items and locally constructed components is known to have been made.

5. Rapid installation capabilities: There are four distinct stages to the construction of the Sanitation Units. These are: a) the movement of the dirt to build a mound upon which the main structure sits; b) the building of the main structure; c) the installation of the pipes and bladder; and d) the installation of a water system.

The amount of dirt needed to build the recommended size mound is approximately 6,000 cubic feet. It should be noted that this amount far exceeds the amount of dirt excavated from the sludge pit. Additional dirt must therefore be transported from the surrounding areas. Although such sources as drainage ditches may provide some dirt, the availability may be problematic in high density areas.

Installation of the required water system may well be one of the most common variables in completion time. Tube wells, sunk by hand, are used effectively in Bangladesh. In the Tongi camp, three days were required to sink the tube wells to the 100-180 feet required to reach the sand-bearing layer. The pump must then be installed.

In Mirpur, construction of the first Unit was reported to have taken 20 to 25 days. The construction time was reduced to twelve days for the second and third Units.

The construction time of the Unit will undoubtedly vary with the number of people constructing the Unit, the level of experience and competence of personnel, and the type and availability of soil. Personnel with an understanding of such Units will certainly be required as with any such system.

6. Useful irrespective of soil conditions: The OXFAM Sanitation Unit does not depend on the soil for disposal or treatment of the sludge. The soil conditions are, however, an important factor in building the dirt mound and in the disposal of the effluent.

No criteria were set for climatic conditions, but this may also be an important variable. Issues that should be addressed include:

- a) To what extent is the sludge and compost a health hazard during the rainy season when drying is prevented?
- b) What effect does temperature have on the digestive process? Are the Units effective with cold night temperatures or in colder climates (as in high altitudes)?

7. Should operate by gravity: The Units do operate by gravity except for raising the water for flushing, which is done with hand pumps.

8. No chemical dosing procedures should be required: No chemical dosing procedures are presently used.

9. Manageable maintenance:

Cleanliness: To date, the Units have been well maintained. Certainly a major factor in the acceptance of the Units has been their cleanliness which has been possible because money was available to hire a person to clean the Units, and that person was closely supervised.

Flushing: Certainly an important part of the maintenance of the Units is the flushing system. Although a person is hired to pump the small reservoir full, then flush the system (every 15 minutes), it has not worked well, in that the pumpers do not pump the required amounts when not under observation. Different systems are being evaluated to improve the reliability of amounts of water required.

Desludging: Desludging the digester tanks is recommended (by Lloyd) every ten weeks. This depends in part on volume of use. There is, however, a need for objective criteria regarding when the tanks should be desludged. Such is not known at present by the desludging crew.

At least in Mirpur, information about desludging existed within the local community and was carried out without expatriate assistance.

If manual methods only are used in desludging, the process is estimated to take about five days per Unit. If mechanized water pumps are used, this time may be reduced to 1-3/4 days or so. The time required is confusing because it depends on whether the transfer of the aged compost from the sludge bed to the compost pile is considered, or whether the desludging time is only calculated for draining and rinsing the tanks. Draining and filling the tanks with a mechanical pump may only require three to five hours.

10. Mobile: The drainage system and tanks are movable as has been demonstrated in the one relocation.

### III. Comments

It is the opinion of this evaluator that the OXFAM Sanitation Units in Bangladesh have been a very positive contribution. The Sanitation Units, under the conditions used, have proven to be very effective, and have generally achieved the goals projected.

The conditions in Bangladesh under which the Units are used have many specific characteristics, such as a refugee camp situation, high water table, good possibility of flooding, and relatively easy access to ground water. Under such conditions, the criteria outlined for the Sanitation Unit seem quite justified. Generalizing the experience of Bangladesh to other situations, however, demands that the initial criteria be questioned:

- Is mobility a significant enough necessity that it merits the need for importing such specialized components?
- What are the realistic time constraints on building a septic system?
- If a digester-type system is desired, is it not possible to build the tanks of local materials?
- Are the Units viable and/or successful if set up without a strong administration for supervision and maintenance?



- Would other type systems be generally successful if supported with similar levels of paid staff for supervision and maintenance?
- What are the criteria for deciding when the Sanitation Units are optimal and when other systems should be used?
- Under what conditions are treatment by chemicals, or filtration, or simple collection, viable options?

The Bangladesh experience seems to indicate that there are many considerations to the installation and use of the OXFAM Sanitation Unit:

Availability of water: The Unit's operation is dependent upon the availability of large volumes of water, not merely for flushing, but also for dilution. In Bangladesh, it was possible to hand-sink wells for easy access to water. Water availability should be pointed out as one of the primary criteria for when the Unit can be used.

Provision of an acceptable place for excretion: The OXFAM Sanitation Units have been praised in most reports for their cleanliness (and in the field compared to the government latrines). But cleanliness refers more to maintenance than system type. Maintenance has been closely organized and supervised by relief agencies. The implication seems to be that if the relief agency assumes the responsibility for providing the sanitation facilities, it must plan on assuming the responsibility for maintenance, at least initially.

Construction: Construction time will undoubtedly vary, but the experience of Bangladesh seems to indicate that construction can be expected to take a minimum of several weeks. This refers more to a practical time expected than to a theoretical time possible. No examples are known by this evaluator of the Unit being set up independent of a skilled person acquainted with the Unit. It should also be noted that moving the dirt to build the mound requires a massive labor input and may be an important consideration.

Treatment: From information available to date, the system is very effective in treating the sewage. As mentioned, problems do still exist in containment of the effluent, but this may be resolved. A consideration in the use of the system must be the disposal of the sludge.

In summary, the OXFAM Sanitation Unit is a pre-packaged sewage treatment system. In situations where there is water available, labor to build the dirt mound, skilled or experienced people to set up the Unit, an organization to supervise and maintain the Units, no locally-available sewage system, and soil conditions which mitigate against the use of any other system, then the OXFAM Sanitation Unit can be justified, and under those conditions is probably one of the finest systems developed to date.

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